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DEPARTMENT OF NATURAL RESOURCES


MICHAEL R. STYLER
Executive Director

Division of Oil Gas and Mining

JOHN R. BAZA
Division Director

October 11, 2007

TO: Minerals File

FROM: Thomas Munson, Senior Reclamation Hydrologist 

SUBJECT: Site Visit Butterfield Canyon, Bingham Canyon, Butterfield Canyon, M035002, Salt Lake County, Utah

Date of Inspection: October 11, 2007
Time of Inspection: 9:00 AM-11:30AM
Conditions: Sunny
Participants: Vicki Peacy, Chris Kaiser, Jason Doyle, Bob Baice, Kennecott; Tom Munson, DOGM

Purpose of Visit:

To look at the sediment and debris structures in place at the base of the dumps draining to Butterfield Canyon.

Observations:

Yosemite Drainage

This drainage experienced a storm water and sediment release July 27, 2007. The purpose of the visit was a follow up visit to look at all the mechanisms in place to treat surface water and sediment/debris. The fact that there was inadequate storage for the sediment and debris that inundated the inlet of the check dam prior to the cut off wall and caused the structure to fail and release sediment and storm water to Butterfield Creek promulgated a closer look at the system in place.

Since that storm event, Kennecott has installed a 7-foot raiser on the culvert traveling beneath the access road to provide some additional detention storage of water and sediment storage, cleaned the sediment pond, and installed some trenches below the dumps to catch sediment.

The group first stopped and looked at the 7-foot raiser and determined that a trash hood and rack would be a good thing to install on the open end of the raiser. This will prevent future woody debris from blocking the culvert.

The next stop was a small check dam that was in place during the storm and reached its capacity fairly quickly during the storm, overtopping allowing sediment and water to flow into the road culvert. A sediment sample trapped behind this check dam was collected and Kennecott offered to analyze the particle size of the sample to determine what size particles were being trapped by this structure determining its effectiveness. In discussions with all on site, it appeared that this structure could be improved by adding more rock to increase the height of the structure. I mentioned that 6-24 inch angular rock is the



needed when building check dams. The spillway and shape of the current structure was good and should be maintained.

Sediment/Debris Basin - The next stop was the sediment/debris basin above the cut off wall. Since this sediment basin is almost directly below the dumps the space available to store sediment is limited. Casual observation also shows a lot of dump face contributing to this structure, therefore the need for significant bed load and sediment storage. The basin had been cleaned out since the last storm and the bed load and sediment above the dam was manipulated to catch bed load/ sediment in any future storms. According to the people involved in the clean out of the sediment basin, large enough equipment needed to do the job was not available which affects the outcome. Four long trenches were constructed and piles of debris were piled up to construct a more meandering path to slow storm water flow and collect bed load/sediment. Several ideas were discussed related to this basin. They are as follows:

Inlet structure - It was inadequately designed and because it is at the base of the sediment basin and easily blocked, it causes the structure to fail prematurely when blocked. The amount of easily eroded bed load/sediment above the inlet provides a ready source of material to block the inlet. The inlet structure needs some engineering improvement to help it better serve its intended purpose. The inlets observed in Upper Castro and South Saint's Rest were more substantial and a design like these inlets would better serve this collection basin.

Baffles and trenches above the inlet - Baffles, trenches, etc., although a good idea, failed to look at a couple of things in their implementation. The major one was elevation and storage volume. Again, the lack of equipment issue failed to address the needs of the construction people and because of this, structures less than adequate were built. According to the people involved, equipment was not available to complete the job due to the high demand for equipment statewide and lack of construction people failing to bid on the job. It appears that this will hamper future efforts to resolve the problem, limiting the ability of the people involved in accomplishing their tasks. Baffles and trenches are only a useful tool if put together with the proper construction equipment, consideration given to storage capacity based on elevation and shape, and constructed of suitable materials. Due to the lack of rock, the existing structures were constructed of the same material that had been eroded off the dumps. This material could be easily eroded again. It is essential that these structures be constructed with the proper construction equipment to properly install the structures. The intent was good but the implementation was less than adequate.

Water courses at the base of the dumps - The last area looked at, was the water courses that run parallel to the base of dumps and empty into the sediment basin. It was felt that there was adequate rock adjacent to these water courses that could be used to construct more check dams slowing the peak flows coming off the dumps and providing additional sediment storage prior to the detention basin. The limitation in completing this task, was once again, adequate equipment and engineering assistance to complete the task.

Conclusion

The overall implementation of engineering plans to improve the mechanisms to trap sediment/bed load from the waste dumps will be hampered if the money, engineering expertise and dedicated equipment to complete these projects is not made available to the people involved. It is very apparent that there is a commitment of the personnel to complete the task and a understanding of the needs to make it work, but

Page 3

Kennecott/ Butterfield Canyon

M/035/002

Site Visit Date: 10/11/2007; Report Date: 10/11/2007

until Kennecott's management supports the needs of its people with money, engineering support, and dedicated equipment, the tasks needed will never be completed to the level needed to prevent future problems in Butterfield Canyon.

cc: Chris Kaiser, Kennecott

Vicki Peacy, Kennecott

Jason Doyle, Kennecott

Bob Baice, Kennecott

Beth Ericksen

Daron Haddock

Susan White

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